(No Model.) 3 Sheets—Sheet 1.

C. B. COTTRELL.

FEEDING APPARATUS FOR PRINTING MACHINES.

No. 466,030. Patented Dec. 29, 1891.

Fig. 1.

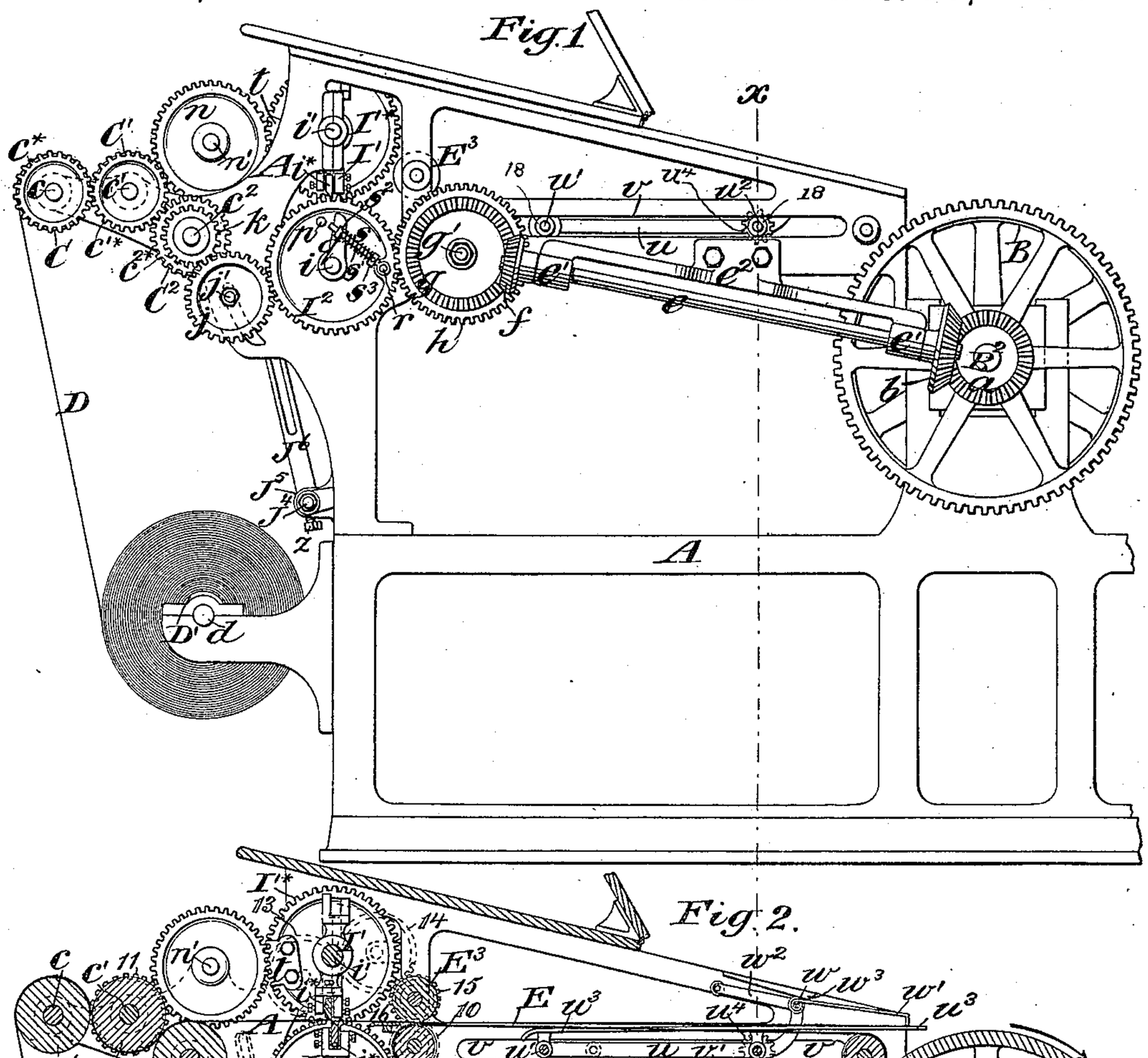

Fig. 2.

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(No Model.) 3 Sheets—Sheet 2.

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Fig. 3.

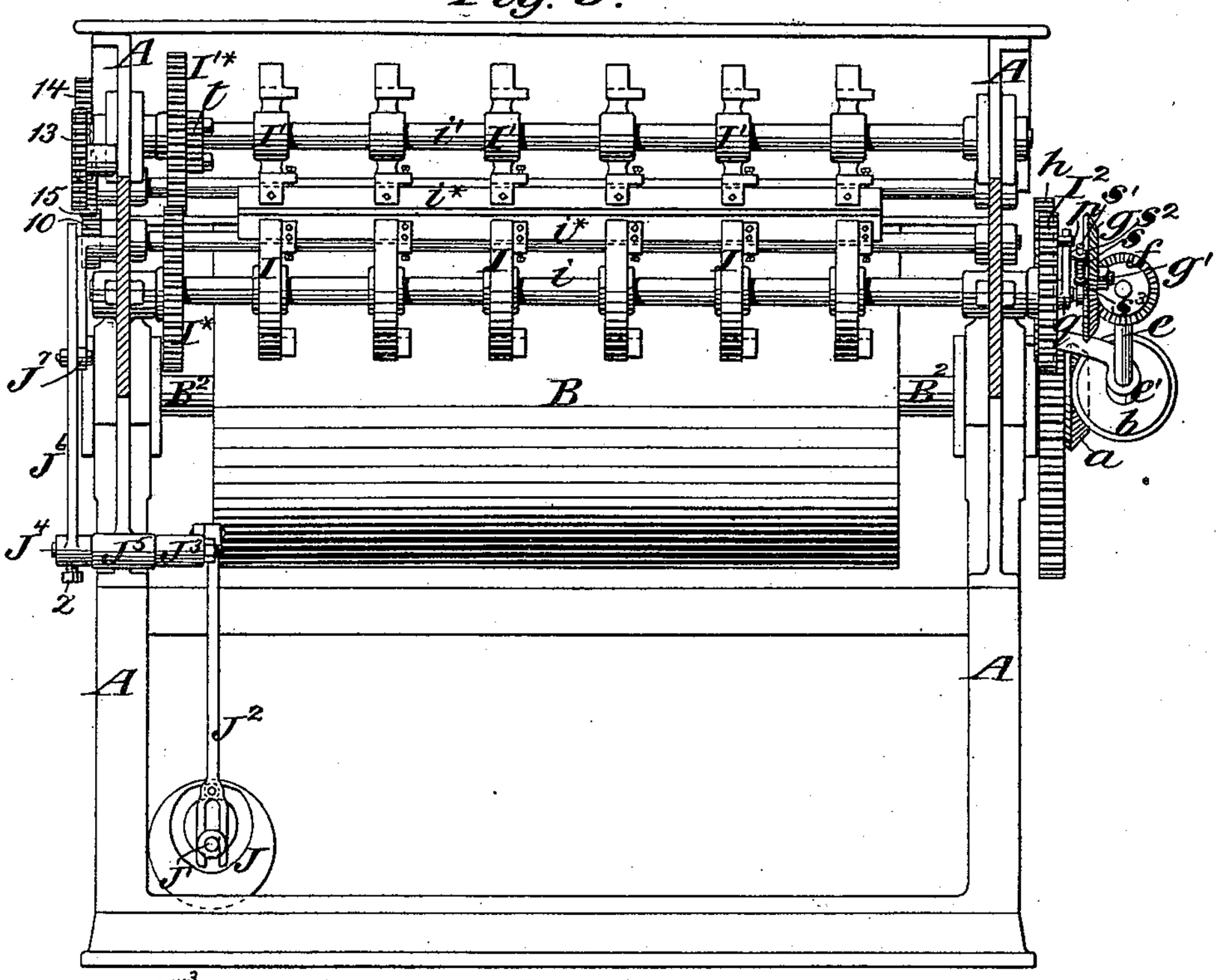
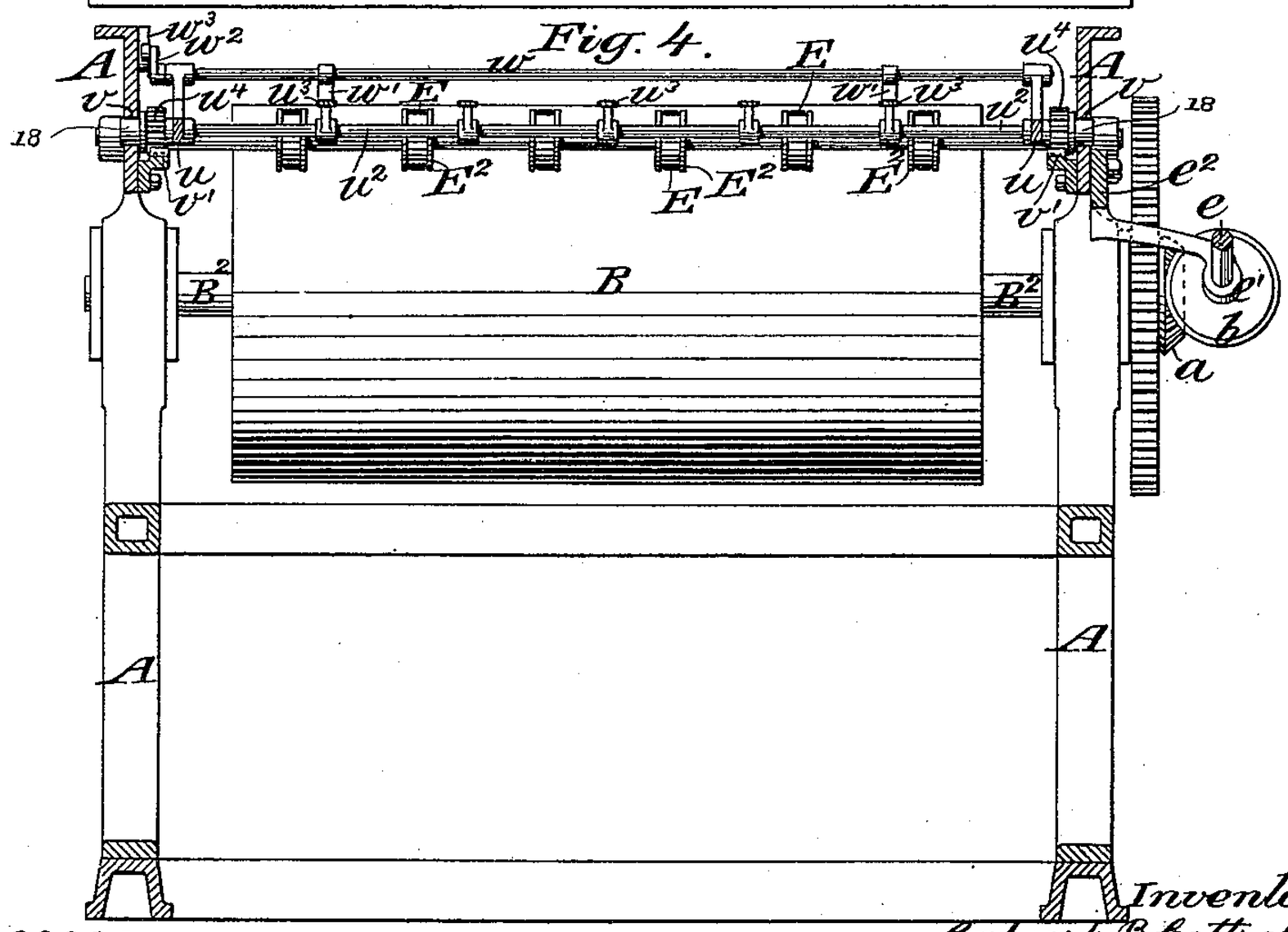


Fig. 4.



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(No Model.) 3 Sheets—Sheet 3.

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FEEDING APPARATUS FOR PRINTING MACHINES.

No. 466,030. Patented Dec. 29, 1891.

Fig. 5.

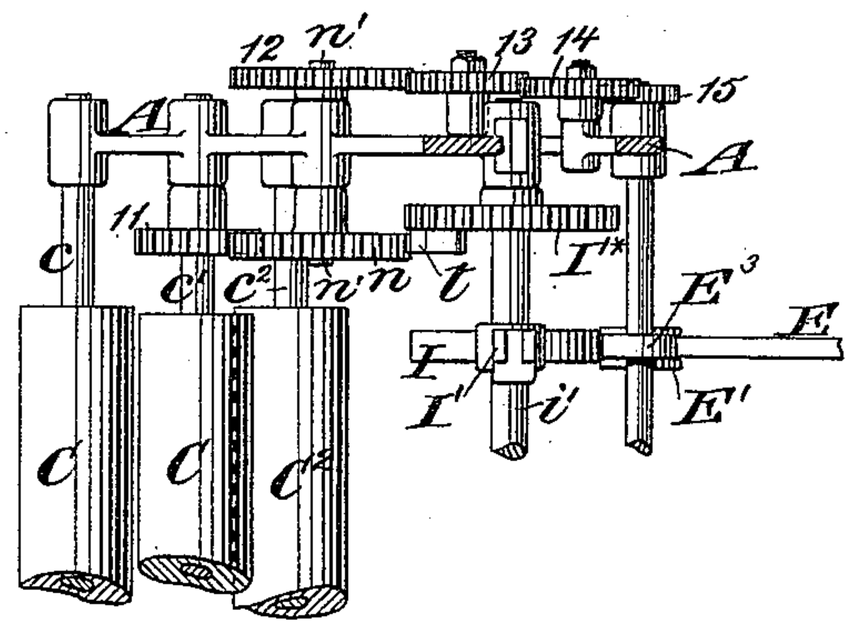
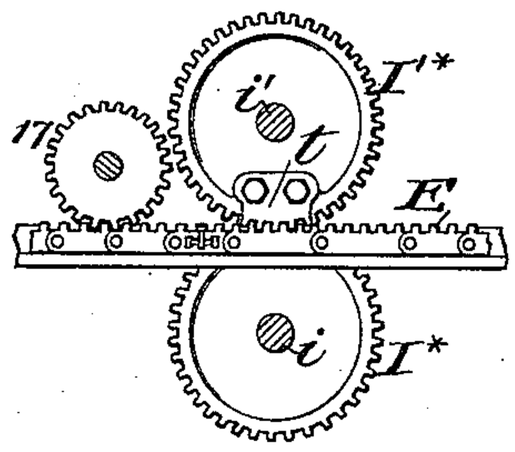


Fig. 6.



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FEEDING APPARATUS FOR PRINTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 466,030, dated December 29, 1891.

Application filed May 14, 1891. Serial No. 392,686. (No model.)

To all whom it may concern:

Be it known that I, CALVERT B. COTTRELL, of Westerly, in the county of Washington and State of Rhode Island, have invented a new and useful Improvement in Feeding Apparatus for Printing-Machines, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to what is known as a "roll-feed," the paper being supplied to the printing-machine from a roll or continuous web and cut into sheets, which are successively fed to the impression-cylinder.

The improvement consists in means hereinafter described and claimed for cutting up a roll of paper into sheets of different lengths and means of properly feeding the sheets to the cylinder with due regard to their lengths.

In carrying out my invention I employ a rotary cutter which cuts the web into sheets while it is in motion. The number of revolutions of such a cutter must always correspond with the number of those of the cylinder; but the speed of the feed of the web must vary relatively to the cylinder, according to the different lengths of sheets, and therefore if the velocity of the cutter be constant it can only correspond with that of the feed for cutting sheets of one certain length. Hence in sheets of different lengths, although the cutting is performed almost instantaneously, any difference between the velocity of the cutter and that of the feed produces some liability to tear, or at least prevents as clean a cut as is desirable. An important object of the present improvement is to overcome this objection; and to this end, according to the said improvement, while the average velocity of revolution of the cutter is constant relatively to that of the cylinder, its velocity at the time of making the cut always corresponds exactly with the velocity of the feed or movement of the paper, notwithstanding any variation of the latter's velocity.

I will now proceed to describe the construction and operation of the invention, with reference to the drawings, in which—

Figure 1 represents a side view of those parts of a two-revolution printing-machine necessary to illustrate my invention, including the impression-cylinder and the feeding apparatus. Fig. 2 is a longitudinal vertical sectional view corresponding with Fig. 1. Fig. 3 is a transverse vertical sectional view taken in an irregular line just behind the cutter. Fig. 4 is a transverse vertical sectional view taken in the line $x\ x$ of Figs. 1 and 2. Fig. 5 is a plan view of part of one of the side frames and some of the gearing of the feeding apparatus, which will be hereinafter described. Fig. 6 is a side view of the cutting apparatus and the means of driving it, illustrating a modification of my invention.

Similar letters and numbers of reference designate corresponding parts in all the figures.

A designates the framing of the machine; B, the impression-cylinder, furnished with the usual grippers B′, and C C′ C^2 are the feed-rollers for feeding a web D of paper from a roller D′, which supplies it. The shafts $c\ c'$ c^2 of the said feed-rollers and the shaft d of the roller D′ are arranged in suitable bearings in the framing, and the feed-rollers are geared together by spur-gears c^* c'^* c^{2*} on their respective shafts. Some distance in front of the said feed-rollers C C′ C^2, between the said rollers and the cylinder B, there is arranged an endless carrier consisting of a series of endless tapes E, which run on rollers E′ E^2, the shafts of which are supported in bearings in the side framing of the machine, and above the rollers E′ of the carrier there are shaft-carrying pressure-rollers E^3, the said carrier and pressure-rollers constituting parts of the web-feeding apparatus and the said carrier forming part of the apparatus for feeding the cut sheets. The carrier E must be driven at a velocity always corresponding with that of the feed of the web by the rollers C C′ C^2, and for that purpose the shaft of the rollers E′ is furnished with a spur-gear 10, which is geared, as shown in Figs. 3 and 5 and partly shown in Fig. 2, with a gear 11 on the shaft c' of the feed-roller C′, the said gearing being effected through a train of spur-gears 12 13 14 15, the said gear 12 being on a short shaft n', which turns in bearings in the framing, the gears 13 14 turning freely on studs secured in the framing, and the gear 15 being on the shaft of the pressure-rollers E^3 and gearing with the gear 10 on the shaft of the rollers E′.

Behind the carrier E, between it and the

feed-rollers C C′ C², there is arranged the rotary cutter, which is represented as of a well-known kind, consisting of two shafts *i i′*, running in bearings in the side framing and carrying cutter-stocks I I′, in which are secured the cutter-blades *i* i**. The said shafts are geared together by gears I* I′*, the pitch-line circumference of which is equal to the length of the shortest sheet to be cut. On the shaft *i* of the lower cutter-stock is a spur-gear I², through which, except at intervals, as hereinafter described, the said lower cutter-shaft *i* derives rotary motion. The said gear I² derives motion, at a speed which never varies relatively to that of the cylinder, from a bevel-gear *a* on the cylinder-shaft B². This bevel-gear *a* gears with and drives a bevel-gear *b* on the end of the shaft *e*, which works in bearings *e′* in a bracket *e²* outside of the framing A, and on the other end of which is a bevel-gear *f*, gearing with and driving a bevel-gear *g*, running freely on a stud *g′*, secured in the framing. To this bevel-gear *g* is affixed a spur-gear *h*, which gears and drives the spur-gear I² on the cutter-shaft *i*.

The feed-rollers C C′ C² and the carrier E all derive their motion from the aforesaid gear I² on the lower cutter-shaft. The said gear I² gears with and drives a spur-gear *j*, which turns freely on a stud *j′*, secured in the framing, and the said gear *j* gears with and drives a spur-gear *k* on the shaft *c²* of the feed-roller C², and so drives all the feed-rollers and the carrier-roller E′, which is geared with the feed-roller C′, as hereinbefore described. The gear *k*, which is changeable for one of a larger or smaller size, is the same as the changeable gear described in my Letters Patent No. 431,201, dated July 1, 1890, for varying the speed of the feed and of the carrier relatively to the cylinder for cutting sheets of different lengths, and, in fact, the whole train of gearing hereinabove described between the cylinder and the feed-roller C², except the gear I² on the lower cutter-shaft, is the same as in said Letters Patent. According to my said Letters Patent the said gear I² is fast upon the cutter-shaft *i;* but for the purpose of providing for the variation of the speed of the cutter-blades to correspond with the variation of the speed of the feed and the carrier the said gear I² is, according to the present improvement, fitted loosely to the said shaft *i* and has a yielding connection therewith. This yielding connection consists as follows: On the outer face of the said gear I² is a pin or projection *p* for driving the said shaft by its action against an arm *q*, which is fast on the said shaft. Between the said arm *q* and a stud *r* on the gear I² is applied a spiral spring *s*, which is coiled upon an eyebolt *s′*, pivoted on said stud and passing through a guide *s²* on the said arm, the spring, by its pressure between said guide and a collar *s³* on said bolt, tending to keep the said projection *p* in contact with the said arm, but permitting the said arm to move away from the said projection *p*, and thereby to permit the speed of rotation of the cutter-shaft to be temporarily accelerated relatively to the cylinder when the speed of the feed-rollers and carrier is accelerated for the purpose of cutting longer sheets. This acceleration of speed of the cutter is produced by temporarily engaging the gear I′* on the upper cutter-shaft *i′* with a gear *n* (see Figs. 1 and 2) on the short shaft *n′*, hereinbefore mentioned, which carries the gear 12, constituting part of the train through which the carrier E is driven from the feed-roller C′, the said train being a continuation of the before-described train between the cylinder and the feed-rollers which includes the changeable gear *k*. For the purpose of thus temporarily engaging the said gear I′* with the said gear *n*, I provide on the back or inner face of said gear I′*, as shown in Figs. 2 and 3, a short toothed sector *t*, which comes into gear with the said gear *n* just before the edges of the cutter-blades *i** come together in their revolution and continues so in gear, driving the cutter at the accelerated speed until the blades have passed each other. After the sector *t* runs out of gear from the said gear *n* the rotation of the cutter-shafts is temporarily suspended or retarded until the lower cutter-shaft, which has run away from the projection *p* on the loose gear I², is overtaken by the said projection and the driving of the cutter-shafts by means of the gear I² is resumed, the lower cutter-shaft being driven through the upper one by the changeable gear *k* at and just before and after the time of cutting, and the upper one being at other times driven through the lower one from the cylinder without the intervention of the changeable gear.

It will be understood that, the largest size changeable gear *k* being proportioned for feeding and cutting the paper for the shorter sheets when that size gear is used, the cutter-shafts will both rotate at uniform speed; but when a smaller changeable gear is substituted and the feed-rollers and carrier are moved faster relatively to the cylinder for cutting longer sheets the said smaller gear will produce a correspondingly accelerated speed of the cutter at the time the cutting takes place. This acceleration being followed by a corresponding retardation, the average velocity of the cutter remains the same—that is to say, the cutter always makes the same number of revolutions relatively to the cylinder.

In Figs. 2 and 3 there is shown a reciprocating carriage *u u′ u² u³* for taking the cut sheets from the carrier E and carrying them forward to a position for their front edges to be taken by the cylinder-grippers. This carriage consists of two side bars *u*, two axles *u′ u²*, and a series of thin strips of metal *u³*, supported on the axles and coming between the tapes of the carrier E to receive the sheet. Both axles *u u′* of the carriage are furnished with rollers 18, to run in ways *v*, provided in

or on the side framing of the machine, and the front axle u^2, which turns in the side bars u, has fast upon it two similar spur-gears u^4, which run in two stationary toothed racks v' on the side framing for the purpose of causing the carriage to run straight. The front ends of the side bars of the reciprocating carriage are turned upward and have bearings provided in them for a small shaft w, to which are secured two feed-gages w', the turned-down ends of which may rest upon two of the sheet-supporting strips u^3. On one end of the gage-shaft w is a backwardly-projecting arm w^2, furnished at its end with a roller to run under a stationary cam w^3, provided on the side framing for the purpose of lifting the gages. The reciprocating movement of the carriage $u\ u'\ u^2\ u^3$ is represented as produced by a cam J (see Figs. 2 and 3) on the shaft J', which may be what is commonly known as the "side shaft" of the printing-machine, arranged just within and parallel with one of the side frames A, the said cam operating on a yoke J^2, which is suspended from the arm J^3 on the inner end of a rock-shaft J^4, which works in a stationary bearing J^5 on one of the side frames, and on the outer end of which is secured a long slotted rocking arm J^6, which is connected with the carrier by a rod J^7. The connection of the said rod J^7 with the said arm J^6 is adjustable in the slot of the said arm at different distances from the rock-shaft to vary the length of travel of the carriage in proportion to the length of the sheets, the shorter sheet requiring a longer movement, and vice versa, and the said arm J^6 is adjustably fastened on the rock-shaft J^4 by means of a set-screw z, which permits it to be set more or less back or forward about the axis of the said shaft, so that whatever the length of the travel of the carriage the carriage may always move forward to one point to present the sheet properly to the impression-surface of the cylinder to be taken by the grippers B', its backward movement always being to such a point that the carrier will bring the front edge of the sheet, whatever its length, up to the gages w'. The cam brings the carriage to its backward position after the front edge of the web of paper has passed some distance between the rollers $E'\ E^3$, and the carriage then remains stationary, while the end of the web is carried forward over it by the said rollers and the tapes and while the sheet is cut from the web and until the cut sheet is carried forward by the tapes far enough for its front edge to strike the gages w'. At this instant the cam J starts the carriage forward and the carriage takes the sheet from the tapes and carries it along until its front edge reaches the front, where the cylinder-grippers seize it, when the gages w' are raised by the cam w^3 to allow the sheet to pass under them and onto the impression-surface of the cylinder.

In order to insure the sheet being taken by the reciprocating carriage $u\ u'\ u^2\ u^3$ from the tapes E of the endless carrier, the said carrier is so arranged that the tapes have a slightly-downward inclination toward the cylinder, while the strips u^3 of the reciprocating carriage are arranged and move horizontally, the rear portions of the said tapes being slightly above the said strips u^3 and the front portions being slightly below. By this inclination of the tapes they are caused to pass clear of the sheet after depositing it upon the strips u^3 of the carriage.

In order to prevent the front edge of the web, after the sheet has been cut off, from passing downward over the lower cutter-stock and insure its being taken by the rollers $E'\ E^3$ and the carrier-tapes E, I have represented in Fig. 2 a plate 16 between the cutter and the rollers $E'\ E^3$.

According to the modification of my present invention illustrated in Fig. 6, an endless carrier E, like that shown in my Letters Patent No. 431,201, dated July 1, 1890, is employed, said carrier consisting of endless toothed racks furnished with grippers for holding the sheets by the side edges, and the cutting of the web into sheets is effected while the web is in the said carrier. In adapting my invention to such a carrier, instead of providing a spur-gear like n' to engage with the toothed sector t for the purpose of driving the cutters at an accelerated speed, I arrange the said sector on the gear I'^* to engage with the teeth of the carrier E at the time of cutting, and hence the speed of the cutter at that time must always correspond with the speed of the carrier.

In Fig. 6 the gear 17 represented is that for driving the endless toothed carrier E, and corresponds with the gear represented as employed for that purpose in my aforesaid Letters Patent constituting part of the same train in which the changeable gear k is situated.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, with the impression-cylinder of a printing-machine, of a feeding apparatus for feeding a web of paper toward said cylinder, a cutting apparatus consisting of two rotary shafts geared together and cutters thereon, a train of gearing for driving the feeding apparatus including a changeable gear for varying the speed of said apparatus relatively to the cylinder and a loose gear upon one of the cutter-shafts, a connection between the said shaft and loose gear to drive the said cutting apparatus while not cutting but yielding to permit the speed of the cutters to be accelerated while cutting, and a toothed sector on one of the cutter-shafts for temporarily engaging it with the said train of gearing to drive the cutters at a speed corresponding with the feed while cutting, all substantially as herein describd.

2. The combination, with the impr ss o - cylinder of a printing-machine and a feeding apparatus for feeding a web of paper toward said cylinder, of the two intergeared cutter-

shafts *i i'*, the gear I^2, and the arm *q*, one loose and the other fast on the said shaft, the said gear being geared with the cylinder to rotate at a constant speed relatively thereto, the spring *s* between said arm and gear to take up lost motion of said gear on said shaft, the changeable gear *k* between the cylinder and feeding apparatus, and a toothed sector *l*, affixed to the other shaft *i'*, to be driven at intervals through the changeable gear, substantially as herein set forth.

3. The combination, with the impression-cylinder of a printing-machine, an endless carrier for carrying sheets of paper toward the cylinder, a train of gearing including a changeable gear for driving said carrier at different speeds according to different lengths of sheet, and a reciprocating carriage for receiving sheets from said carrier, of a cam-actuated rock-shaft, a rocking arm on said rock-shaft for driving said reciprocating carriage, and a connection between said rocking arm and said carriage, means for adjusting the said rocking arm about the axis of said shaft, and means for adjusting the said connection on the said arm at different distances from the said rock-shaft, all substantially as and for the purpose herein set forth.

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